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**[5668]-118**

**S.E. (Mech. & Automobile Engg.) (II Sem.) EXAMINATION, 2019**

**ENGINEERING METALLURGY**

**(2015 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B. :—** Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

1. (a) Explain the factors that govern Hume Rothery's rules of solid solubility. [4]
- (b) What is the allotropic transformation ? Give any *three* examples which show allotropic transformation. [4]
- (c) With the help of a neat sketch explain the difference in the flow lines observed in forged components and cast components. [4]

*Or*

2. (a) State True or False and justify : [4]  
Etching is essential for the study of inclusions.
- (b) State the working principle and applications of scanning electron microscopy. [4]
- (c) What is coring ? Which alloys show cored structures and under what conditions. [4]

P.T.O.

3. (a) Draw Fe-C equilibrium diagram and label the temperatures, composition and phases. [6]
- (b) Why do Hypoeutectoid steels with Widmanstatten structures have low toughness and ductility values ? [3]
- (c) Differentiate between Annealed and Normalised components with the help of the following criteria : [4]
- (i) Tensile strength
  - (ii) Microstructure
  - (iii) Grain size distribution
  - (iv) Internal stresses.

Or

4. (a) Define the critical cooling rate of steel and show the same on a TTT diagram. State the main factors responsible for the critical cooling rate. [6]
- (b) "Hardening of steel is always followed by tempering", is it true or false ? Justify. [3]
- (c) Differentiate between Malleable Cast Iron and Gray Cast Iron with the help of the following criteria : [4]
- (i) Method of formation of graphite
  - (ii) Damping capacity
  - (iii) Machinability
  - (iv) Applications.

5. (a) State the composition of the following steel which is specified as per Indian Standard Designation System : [4]
- (i) T75W18Cr4V1
  - (ii) Fe410K

- (b) Explain classification of Alloying Elements of steel with respect to the relation with carbon. Give examples for each category. [5]
- (c) Explain the function of Addition of Tungsten as an Alloying Element in steel. [4]

Or

6. (a) Some of the High Carbon High Chromium (HCHC) tool steel contains carbon more than 2% still they are classified as steels and not cast irons. Why ? [4]
- (b) Explain the importance of manganese as an alloying element in steel. How does it influence the isothermal transformation diagrams ? Give a typical composition of steel which has excellent wear resistance and is non-magnetic. [5]
- (c) What are super alloys ? State any three types of super alloys with a suitable example. [4]
7. (a) Which alloying element is used in Free-Cutting Copper and why is it called so ? State the applications of free cutting copper. [4]
- (b) What is equivalent Zinc of Brass ? Give an example and explain its significance and usefulness. [4]
- (c) State the composition of Y-alloy. State its properties and applications. [4]

Or

8. (a) Which are the elements in a Tin Bronze alloy ? What is the need of Deoxidizing Tin Bronze ? Which are the common deoxidizers used for the purpose of Deoxidizing Tin Bronze. [4]
- (b) State any *three* desirable properties that need to be possessed by a good Bearing Material. What is a bimetal bearing. [4]
- (c) State any *four* properties that makes Aluminium Alloy eligible to be used as a material for connecting rods and main bearing in Automobiles. [4]